GENETICS, PH.D.

Graduate training in genetics emphasizes study and research leading to a Ph.D. degree in genetics. M.S. degrees in medical genetics with specialized training in genetic counseling are also available. For more information on M.S. degrees in genetic counseling, see Genetic Counseling (http://www.med.wisc.edu/education/graduate-programs/genetic-counseling/main/26910).

The goal of the genetics graduate program is to train the next generation of professional geneticists. This includes selecting the most promising university graduates for admission to the program and training those students in the methods and logic of genetic analysis. Such analyses are increasingly important in contemporary biological and biomedical research. The curriculum includes:

1. coursework on the principles of genetics and on the methods of genetic and genomic analyses, and
2. original research in a specialized area, which culminates in the writing and defense of a doctoral thesis.

The genetics Ph.D. program is administered by the Laboratory of Genetics, which consists of the Department of Genetics in the College of Agricultural and Life Sciences, and the Department of Medical Genetics in the School of Medicine and Public Health. The two departments are administratively distinct, but they function as a single combined department at both the faculty and student levels. The Laboratory of Genetics is highly regarded for its long history of scholarly contributions to the field of genetics, including subdisciplines such as plant genetics, population genetics, developmental genetics, molecular genetics, immunogenetics, neurogenetics, cytogenetics, genetics of viruses, bacterial genetics, and mammalian genetics. The genetics graduate program is supported by the oldest and one of the largest NIH-funded genetics training grants in the country.

The strength of genetics research at Wisconsin derives in large part from the Laboratory of Genetics, but state-of-the-art genetics research is conducted in many campus departments and centers. Training faculty of the genetics Ph.D. program includes 84 trainers selected from 22 campus departments and schools based on the strength of their scholarly genetics research. Genetics Ph.D. students choose one of the 84 training faculty as the graduate thesis advisor and mentor. Faculty trainers of the genetics Ph.D. program include those with academic appointments and research laboratories in the departments of Agronomy, Bacteriology, Biochemistry, Biomolecular Chemistry, Biostatistics and Medical Informatics, Botany, Cell and Regenerative Biology, Genetics, Horticulture, Medical Genetics, Medical Microbiology and Immunology, Medicine, Neuroscience, Neurology, Nutritional Science, Oncology, Ophthalmology and Visual Sciences, Pediatrics, Plant Pathology, and Zoology, as well as the Laboratory of Molecular Biology and the School of Pharmacy.

Genetics graduate students spend time during the first semester of graduate school in the laboratories of three or four faculty trainers, selected by the student. Following rotations, a graduate thesis advisor is chosen by mutual consent of both student and professor. Students are expected to acquire a broad and fundamental knowledge of genetics during their coursework, after which they conduct independent scholarly research based on individual interests and under the guidance and mentoring of the thesis advisor. Formal coursework requirements are modest, and independent study that includes original research is of paramount importance in the program. Students choose an individualized thesis advisory committee of five faculty members (including the thesis advisor) that approves formal coursework and provides scientific and career development advice throughout a student’s graduate career.

FUNDING

Prospective students should see the program website (http://www.genetics.wisc.edu/PHDProspective.htm) for funding information.

REQUIREMENTS

MINIMUM DEGREE REQUIREMENTS AND SATISFACTORY PROGRESS

To make progress toward a graduate degree, students must meet the Graduate School Minimum Degree Requirements and Satisfactory Progress (http://guide.wisc.edu/graduate/#policiesandrequirementstext) in addition to the requirements of the program.

DOCTORAL DEGREES

Ph.D.

MINIMUM GRADUATE DEGREE CREDIT REQUIREMENT

51 credits

MINIMUM GRADUATE RESIDENCE CREDIT REQUIREMENT

32 credits

MINIMUM GRADUATE COURSEWORK (50%) REQUIREMENT

At least 50% of credits applied toward the graduate degree credit requirement must be completed in graduate-level coursework; courses with the Graduate Level Coursework attribute are identified and searchable in the university's Course Guide (http://my.wisc.edu/CourseGuideRedirect/BrowseByTitle).

PRIOR COURSEWORK REQUIREMENTS: GRADUATE WORK FROM OTHER INSTITUTIONS

For well-prepared advanced students, the program may accept prior graduate coursework from other institutions toward the minimum graduate degree credit and minimum graduate coursework (50%) requirement. The minimum graduate residence credit requirement can be satisfied only with courses taken as a graduate student at UW–Madison. Coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

PRIOR COURSEWORK REQUIREMENTS: UW–MADISON UNDERGRADUATE

For well-prepared advanced students, the program may decide to accept up to 7 credits numbered 300 or above completed at UW–Madison toward fulfillment of minimum degree and minor credit requirements. This work would not be allowed to count toward the 50% graduate coursework minimum unless taken at the 700 level or above. Coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.
A candidate for a doctoral degree who fails to take the final oral examination and deposit the dissertation within five years after passing the preliminary examination may by require to take another preliminary examination and to be admitted to candidacy a second time.

**TIME CONSTRAINTS**

Doctoral degree students who have been absent for ten or more consecutive years lose all credits that they have earned before their absence. Individual programs may count the coursework students completed prior to their absence for meeting program requirements; that coursework may not count toward Graduate School credit requirements.

**LANGUAGE REQUIREMENTS**

No language requirement.

**ADMISSIONS**

Ph.D. students in genetics choose to attend Wisconsin because of their commitment to the discipline of genetics and because of Wisconsin’s strength in that area. Entering students are expected to have a strong background in biology, which should include undergraduate coursework in chemistry, organic chemistry, biochemistry, physics, mathematics through calculus, and statistics. In addition, entering students are expected to have a strong record of independent laboratory research experience.

Admission to the genetics Ph.D. program is highly competitive. A committee of the Laboratory of Genetics reviews applications each fall, invites meritorious applicants for personal interviews each February, and accepts approximately 15 percent of total applications received. An application for admission consists of:

1. a resume,
2. a personal statement that discusses the reasons for pursuing a genetics Ph.D.,
3. an official transcript of coursework sent by the applicant’s undergraduate college or university,
4. three or more letters of recommendation,
5. a report from the Educational Testing Service of scores received on the required GRE General Test and on a recommended but not required Subject Test in Biology or Biochemistry,
6. a report, if appropriate, of scores received on either the TOEFL or IELTS exams of English language proficiency, and
7. any other information or documentation that would help the admissions committee evaluate an applicant’s potential for success in graduate study.

**LEARNING OUTCOMES**

**KNOWLEDGE AND SKILLS**

**KNOWLEDGE**

- Students will demonstrate a broad understanding in the principles of genetics and heredity in all organisms. They will develop particular expertise in at least one of the broad subject areas of the doctoral program.
- Students will demonstrate a broad understanding of major current and past theories, research findings and methodologies and

**PRIOR COURSEWORK REQUIREMENTS: UW–MADISON UNIVERSITY SPECIAL**

The program may decide to accept up to 15 University Special student credits as fulfillment of the minimum graduate residence, graduate degree, or minor credit requirements on occasion as an exception (on a case-by-case basis).

UW–Madison coursework taken as a University Special student would not be allowed to count toward the 50% graduate coursework minimum unless taken at the 700 level or above. Coursework earned ten or more years prior to admission to a doctoral degree is not allowed to satisfy requirements.

**CREDITS PER TERM ALLOWED**

15 credits

**PROGRAM-SPECIFIC COURSES REQUIRED**

Contact the program for information on any additional required courses.

**DOCTORAL MINOR/BREADTH REQUIREMENTS**

Doctoral students must complete a doctoral minor.

**OVERALL GRADUATE GPA REQUIREMENT**

3.00

**OTHER GRADE REQUIREMENTS**

The Graduate School requires an average grade of B or better in all coursework (300 or above, not including research credits) taken as a graduate student unless conditions for probationary status require higher grades. Grades of Incomplete are considered to be unsatisfactory if they are not removed during the next enrolled semester.

**PROBATION POLICY**

The Graduate School regularly reviews the record of any student who earned grades of BC, C, D, F, or Incomplete in a graduate course (300 or above), or grade of U in research credits. This review could result in academic probation with a hold on future enrollment or in being suspended from the Graduate School.

**ADVISOR**

Every graduate student is required to have an advisor. An advisor is a faculty member, or sometimes a committee, from the major department responsible for providing advice regarding graduate studies. An advisor generally serves as the thesis advisor. In many cases, an advisor is assigned to incoming students. Students can be suspended from the Graduate School if they do not have an advisor.

To ensure that students are making satisfactory progress toward a degree, the Graduate School expects them to meet with their advisor on a regular basis.

A committee often accomplishes advising for the students in the early stages of their studies.

**ASSESSMENT AND EXAMINATIONS**

Doctoral students are required to take a comprehensive preliminary/oral examination after they have cleared their record of all Incomplete and Progress grades (other than research and thesis). Deposit of the doctoral dissertation in the Graduate School is required.
techniques in genetics, with particular expertise in their area of concentration, both orally and in writing.

- Students will develop critical thinking skills. They will retrieve and examine scientific literature, evaluate evidence for and against hypotheses, identify knowledge gaps, strengths and weaknesses in existing literature, synthesize knowledge, develop conclusions, and formulate plans for moving the current state of knowledge forward.

### RESEARCH

- Students will develop and complete original research that advances a specific field of study within one of the broad areas subject areas in genetics.
- Students will retrieve, evaluate and interpret professional peer-reviewed literature and use this information to develop theoretical frameworks, testable hypotheses, and predictions for their own research projects.
- Students will design research projects that are feasible, based on well-designed and internally controlled experiments, and address important unsolved problems in genetic or biomedical research.
- Students will conduct independent research, critically evaluate and interpret the resulting data, and, based on that analysis, design future experiments that advance the state of the field.
- Students will write, edit, and assemble manuscripts resulting from their independent research and submit these for publication in peer-reviewed professional journals.

### COMMUNICATION

- Professional scientists are, simultaneously, lifelong students and educators. Students graduating with a master’s degree in genetics will have learned how to communicate effectively to diverse audiences in writing, through oral presentations, and during formal and informal discussions.
- Students will write clear and concise research articles for publication in professional journals.
- Students will present at scientific conferences and in both formal and informal seminars.
- Students will master methods of communicating and interacting effectively with professional colleagues, and will prepare successful applications for research grant support.
- Students will articulate their research and its significance both formally and informally to diverse audiences.
- Students will give and receive feedback on communication skills both orally and in writing.
- Students will be provided with opportunities to engage in public outreach and education.

### EDUCATION

- Students will effectively teach the principles of genetics and the methods used in contemporary genetic research.
- Students will receive in-class educational training by serving as teaching assistants for at least one semester of an undergraduate genetics course.
- Students will be provided with opportunities to mentor other students (for example, undergraduate students) in a laboratory research setting. Interested students will have opportunities to perform outreach activities in which they educate school-age students or individuals from other fields on the principles of modern genetics.

### CAREER PREPARATION

- Students will be provided with diverse training that will prepare them for a range of flexible and sustainable careers in, for example, academia, industry, government, science policy, administration, commerce, journalism, law, education and community outreach.
- Students will develop broadly applicable skills in critical thinking and problem solving.
- Students will be provided with opportunities for teamwork, written and oral communication skills and collaborations.

### PROFESSIONAL CONDUCT

- Students will receive training in professional ethics and the responsible conduct of science.
- Students will be trained to use scientific rigor when designing experiments, collecting and analyzing data, and interpreting and reporting results.
- Students will discuss and formulate opinions on the many situations that working scientists encounter involving professional ethics and conflicts of interest.
- Students will receive training in laws, regulation, permits and licenses, occupational health, safety standards and best practices, will demonstrate understanding of such and adhere to compliance.

### ADDITIONAL LEARNING GOALS

- The genetics Ph.D. program also recognizes and strives to meet the student learning goals of the College of Agriculture and Life Sciences, and of the Overarching Learning Goals approved the UW Graduate Faculty Executive Committee: CALS Student Learning Goals. The college’s goal is to ensure that every student develops:
  - specialized knowledge in at least one discipline, along with an education broad enough to meet the challenges of changing careers and opportunities
  - the ability to think critically and creatively: to synthesize, analyze, and integrate ideas for decision making and problem solving
  - the ability to communicate effectively through writing and speaking by observing, reading, listening, and using appropriate information technologies
  - a global perspective; an appreciation for the interdependencies among individuals and their workplaces, communities, environments, and world; and an understanding of the interrelationships between science and society
  - the ability to work with others in small or large groups, to recognize civic and social responsibilities, and to appreciate the uses of public policy in a democracy
  - a respect for truth, a tolerance for diverse views, and a strong sense of personal and professional ethics

### OVERARCHING DOCTORAL LEVEL LEARNING GOALS APPROVED BY GFEC 11/14/14

Regardless of whether an individual is awarded a master’s degree, the doctoral level learning goals are inclusive of the master’s level learning goals. Research-based doctoral programs culminate in a dissertation. Professional doctoral programs culminate in a project or performance. In addition, students receiving a doctoral degree from the Graduate School in both research-based and professional programs are expected to achieve the following learning goals by the end of their degree work.
• Articulates research problems, potentials, and limits with respect to theory, knowledge, or practice within the field of study.
• Formulates ideas, concepts, designs, and/or techniques beyond the current boundaries of knowledge within the field of study.
• Creates research, scholarship, or performance that makes a substantive contribution.
• Demonstrates breadth within their learning experiences.
• Advances contributions of the field of study to society.
• Communicates complex ideas in a clear and understandable manner.